

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: 10/748,174

Filing Date: December 31, 2003

Appellant: Lukas TROSMAN, et al.

Group Art Unit: 3663

Examiner: Johannes P. MONDT

Title: DISTRIBUTED CLUMPING OF PART-LENGTH RODS FOR A
REACTOR FUEL BUNDLE

Attorney Docket: 8564-000031/US (GE # 127099-1)

APPELLANT'S REPLY BRIEF UNDER 37 C.F.R. §41.41

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Sir:

In response to the Examiner's Answer mailed March 29, 2010, Appellant requests the appeal be maintained and supply the following arguments in reply under 37 C.F.R. §41.41(a)(1).

Claims 24 and 26-29 are not rendered obvious under 35 U.S.C. §103(a) as being unpatentable over Orii in view of Ueda in view of Johansson.

The Examiner rejects claims 24 and 26-29 as being unpatentable over Orii et al. ("Orii") in view of Ueda et al. ("Ueda") and further in view of Johansson et al. ("Johansson"). The Examiner asserts that Orii teaches the basic inventive concept of independent claims 24 and 28 including a generally square fuel bundle having a pair of water passages with circular cross-sections located centrally or proximal center, a first part-length rod group including two pair of part-length fuel rod subsets in a mirror-image along the centerline located between the two water passages and a second part-length rod group including four pair of part-length rods located in the outermost rows of a 10x10 matrix adjacent to one of the four sides of the tube. The Examiner relies on FIG. 15 of Orii, in making this assertion¹.

The Examiner cites Ueda, FIG. 19 and col. 12, lines 53-66, asserting that Ueda indicates that it is well-known in the art to provide certain groupings of part-length rods, and in particular 3-rod subgroups adjacent to a water passage². The Examiner also cites FIG. 25A, and claims 26, 29 and 32 of Ueda in asserting that Ueda discloses a plurality of voids formed above the upper ends of part-length rods³. The Examiner cites col. 2, lines 3-15 of Johansson⁴, asserting that Johansson teaches that the addition of part length rods lowers the pressure drop and thereby improves the critical power of a fuel bundle. The Examiner asserts that the inclusion of a third rod in Orii is no more than the duplication of parts with predictable and intended effects, and the

¹ See page 4, of the December 20, 2006 Office Action.

² See page 4, of the December 20, 2006 Office Action.

³ See page 5 of the Examiner's Answer.

⁴ See page 6, of the December 20, 2006 Office Action.

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conditional Equations of Orii allow for a "broad continuum of parameter values as acceptable solutions for Orii's stated purpose."⁵

In the Examiner's Answer, the Examiner argues the relevance of FIGS. 19 and 25 of Ueda⁶. Specifically, the Examiner argues the following.

Examiner's Arguments on Pages 4 and 5 of the Examiner's Answer:

Ueda et al. show that it is well-known and advantageous expedient in the art to provide certain groupings of part-length rods, particularly a 3-rod subgroup adjacent to a water passage [39] (See Fig. 19; col. 12, lines 53-66).⁷

Ueda et al. disclose a plurality of voids formed above the upper ends of the shorter, or part-length, fuel rods (Fig. 25) (claims 26, 29 and 32).⁸

Appellant asserts that FIG. 19 of Ueda is not relevant to the claimed invention, as column 12, lines 53-66 of Ueda disclose that FIG. 19 uses "interposed" rods (and not part-length rods). The "interposed" rods of Ueda are full-length rods filled with significantly reduced levels of fissile material in at least a portion of the rod, as described in at least column 8, lines 20-59 of Ueda. While Ueda explains that "interposed" member 27 is less than the entire length of a full-length fuel rod (as described for instance in column 8, lines 29-33), this only means that the "interposed" portion 27 (which is the portion 27 including reduced fissile material, as shown for example in FIG. 2) is less than the full-length of a fuel rod. However, the rods included in FIG. 19 are still full-length rods with "interposed" inserts. Therefore, contrary to the Examiner's arguments, "interposed" rods are most certainly not at all equivalent to part-length rods. **The entire purpose of the part-length rods of the**

⁵ See page 3 of the January 27, 2009 Advisory Action.

⁶ See pages 4 and 5 of the Examiner's Answer.

⁷ See page 4 of the Examiner's Answer.

⁸ See page 5 of the Examiner's Answer.

claimed invention is to provide a vacant water volume above the part-length rods to increase the shutdown margin of the reactor. By using full-length "interposed" rods, no vacant water volume is formed above the fuel rods.

Therefore, the Examiner's reliance on FIG. 19 of Ueda is improper, as the embodiment of FIG. 19 provides no guidance at all on the use of part-length fuel rods.

With regard to the Examiner's reliance on FIG. 25 of Ueda, Appellant notes that the Examiner uses Ueda to teach the use of 3-rod groups of part-length rods adjacent to water passages. And as such, FIG. 25 furthers none of the Examiner's arguments. This is because FIG. 25 shows no 3-rod groups of part-length rods (see FIGS. 25B, 25C, and 25D which is an overhead of different elevations of FIG. 25A). Rather, FIG. 25 only shows part-length rods 43 / 51 in a cruciform shape, but not at all in 3-rod groups near a water passage. For at least this reason, the Examiner's reliance on FIG. 25 does not further the Examiner's own arguments in rejecting independent claims 24 and 28.

With regard to the Examiner's reliance on claims 26, 29 and 32 of Ueda, Appellant again submits that these claims are drawn to "interposed" fuel rods (fuel rods with "interposed" inserts 27, as shown for instance in FIG. 2A). "Interposed" rods are not equivalent to part-length rods, for at least the reasons argued above. Therefore, Appellant asserts that the Examiner's reliance on claims 26, 29 and 32 of Ueda is improper, as these claims do not at all disclose part-length rods.

In the Examiner's Answer, the Examiner submits further arguments pertaining to the distinctions between the full-length "interposed" fuel rods of Ueda and the recited "part-length rods." The Examiner also argues that Orii allows for the use of the

full-length "interposed" fuel rods as disclosed in Ueda. Specifically, the Examiner argues the following⁹.

Examiner's Arguments on Pages 10-11 of the Examiner's Answer:

Appellant's third argument is based on the distinctions between "interposed" and "short-length" fuel rods (Ueda et al teaches "interposed" (pages 16-17), meaning short effective length). In the conditions of Orii et al it is the *effective length* of the fuel rods that is subjected to an inequality, i.e., the portion packed with fuel, and hence the "interposed" fuel rod not only meets part-length fuel rod but also is a short fuel rod within the context of the invention by Orii et al. (emphasis added by the Examiner).

Appellant again asserts that an "interposed" fuel rod (a full-length fuel rod with an "interposed" insert that includes significantly reduced levels of fissile material) is not at all equivalent to a part-length rod. The purpose of the recited "part-length rods" of the claimed invention is to provide a vacant water volume above the part-length rod to increase the shutdown margin of the reactor. By using "interposed" rods, no vacant water volume is formed above the fuel rods. Therefore, the "interposed" rods of Ueda are not at all "part-length rods," as recited in independent claims 24 and 28.

With regard to Orii, Orii discloses using an "effective" fuel rod length in determining the fuel rod patterns in each of the six embodiments of Orii. Therefore, it appears that full-length rods with "interposed" inserts, such as the "interposed" rods of Ueda (which, are not at all "part-length rods," as recited in claims 24 and 28), may be used in the Orii fuel rod configurations. That is because the purpose of Orii's fuel rod configurations is to increase burn-up of the fuel, rather than increasing shutdown margin as described in the instant example embodiments. Appellant reiterates that neither Ueda, nor Orii, pertain to the use of "part-length" fuel rods to increase

⁹ See pages 10-11 of the Examiner's Answer.

the shutdown margin of a reactor, as described in instant example embodiments
(which is why both Ueda and Orii may make use of full-length "interposed" fuel
rods). And therefore, only the "effective" fuel rod length is of concern in the Orii disclosure, whereas the actual physical length of the fuel rod is not of concern in Orii. For at least these additional reason, Appellant asserts Ueda in view of Orii and further in view of Johansson does not teach or suggest all of the limitations of independent claims 24 and 28.

In the Examiner's Answer, the Examiner further argues that Orii only discloses an effective length for fuel rods (as opposed to mandating an actual physical length for fuel rods)¹⁰. And, the Examiner argues, in essence, that there is no significant distinction between the use of full-length "interposed" fuel rods and the claimed "part-length rods."¹¹ Specifically, the Examiner argues the following.

Examiner's Arguments on Pages 12 and 13 of the Examiner's Answer:

Again, it is noted that Orii et al delineates based on effective length of the rods (see Orii et al, Abstract), which is applicable to both Ueda's interposed rods (see Ueda et al, see explanation of P rods, col. 5, l. 4+ and col. 8, l. 20+) and to Johansson's contiguous short-length rods and that any non-fuel material, whether water or any other non-nuclear-fuel portion of the fuel rods, inherently increases absorption relative to reactivity and as such allows the optimization taught by Johansson et al and Orii et al.¹²

It is again noted that no criticality is indicated in the specification to be related to the part-length nature of those fuel-rods that are disclosed in the fourth embodiment by Orii et al to be full length rods but are claimed by appellant to be part-length rods. No unexpected results are shown to flow from the distinction in this regard between the claimed invention and the prior art.¹³

¹⁰ See pages 12-13 of the Examiner's Answer.

¹¹ See page 13 of the Examiner's Answer.

¹² See pages 12-13 of the Examiner's Answer.

¹³ See page 13 of the Examiner's Answer.

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Appellant again asserts that while Orii uses a measure of an "effective" fuel rod length (which allows for the use of full-length "interposed" fuel rods, as described for instance in Ueda), such disclosure does not apply to independent claims 24 and 28. Specifically, as described on at least page 2, lines 4-17 and page 3, lines 8-21 of the as-filed application, instant example embodiments provide "part-length" fuel rods in order to increase the shutdown margin of a nuclear reactor. This is accomplished by the presence of vacant volumes of water above the part-length rods, which may trap neutrons from fuel rods adjacent to the vacant volume of water (also described on at least page 2, lines 4-17 and page 3, lines 8-21 of the as-filed application). The use of "interposed" full-length fuel rods (full-length rods with "interposed" inserts), as disclosed by Ueda, does not provide the same vacant volume of water above a part-length rod. For at least these reasons, an "interposed" full-length fuel rod is not a "part-length" fuel rod, as recited in the instant independent claims. Therefore, while the Examiner argues that no unexpected result may be obtained through the use of "part-length" fuel rods, as opposed to full-length "interposed" fuel rods, Appellant asserts for at least the reasons stated above that Appellant's instant written disclosure clearly describe why the use of "part-length" fuel rods is required in the claimed invention.

Neither Ueda, Orii, nor Johansson teach or suggest increasing the shutdown margin of a nuclear reactor. Therefore, any combination of Ueda, Orii, and Johansson does not teach or suggest the pattern of "part-length" fuel rods (as opposed to full-length "interposed" fuel rods) which are recited in independent claims 24 and 28.

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CONCLUSION

In view of these arguments and those previously set forth, Appellants respectfully maintain their request that the Board reverse the Examiner's rejection of the pending claims.

The Commissioner is authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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